

What is claimed is:

1. A haptic device, comprising:
 - a flexible surface capable of reconfiguring its surface characteristics;
 - a haptic substrate coupled to the flexible surface and configured to provide a first pattern in response to a first activating signal; and
 - a deforming mechanism coupled to the flexible surface and configured to deform the flexible surface to a first surface characteristic in accordance with the first pattern.
2. The device of claim 1, further comprising a sensor capable of activating the device when the sensor detects a touch on the flexible surface.
3. The device of claim 1, wherein the deforming mechanism coupled to the flexible surface and configured to deform the flexible surface to a first surface characteristic further includes transform the flexible surface from a second surface characteristic to the first surface characteristic in response to the first pattern.
4. The device of claim 1,
 - wherein the flexible surface is a touch-sensitive surface capable of sensing a touch on its surface; and
 - wherein the haptic substrate is capable of providing a second pattern in response to a second activating signal.
5. The device of claim 4, wherein the haptic substrate is constructed with piezoelectric materials.
6. The device of claim 4, wherein the haptic substrate is constructed by one of micro-electro-mechanical systems ("MEMS") elements, thermal fluid pockets, MEMS pumps, resonant devices, variable porosity membranes, and laminar flow modulation.
7. The device of claim 1, wherein the haptic substrate includes multiple tactile regions wherein each region is capable of being independently activated to form a surface shape of the haptic substrate.
8. The device of claim 1, wherein the haptic substrate is capable of generating a confirmation feedback to confirm an input selection.
9. The device of claim 1, wherein the deforming mechanism is a vacuum generator capable of causing the flexible surface to collapse against the first pattern forming a surface shape in accordance with the first pattern.
10. A method of providing a haptic texture surface, comprising:
 - receiving a first substrate activating signal;
 - generating a first pattern of a haptic substrate via haptic feedback in response to the first substrate activating signal;
 - activating a deforming generator to generate deforming force capable of changing shape of a flexible surface layer; and
 - reconfiguring surface texture of the flexible surface layer to change the surface texture from a first surface characterization to a second surface characterization in accordance with the first pattern.
11. The method of claim 10, further comprising forcing the flexible surface layer against the first pattern to confirm the flexible surface layer having substantially similar topography as the first pattern.
12. The method of claim 10, further comprising:
 - sensing a contact on the flexible surface;
 - generating an input signal in response to the contact; and
 - sending the input signal to a processing unit.
13. The method of claim 10, wherein generating a first pattern of a haptic substrate further includes selecting one of a plurality of surface patterns in accordance with the first substrate activating signal.
14. The method of claim 10, further comprising:
 - receiving a user input via a touch on the flexible surface; and
 - providing a tactile feedback to confirm the user input.
15. The method of claim 10, wherein activating a deforming generator to generate deforming force further includes activating a vacuum generator and creating a vacuum between the flexible surface layer and the first pattern.
16. The method of claim 10, wherein reconfiguring surface texture of the flexible surface layer to change the surface texture from a first surface characterization to a second surface characterization in accordance with the first pattern further includes changing from a smooth surface to a coarse surface.
17. The method of claim 10, wherein generating a first pattern of a haptic substrate further includes activating a plurality of tactile regions of the haptic substrate independently to create a predefined pattern in response to the first substrate activating signal.
18. The method of claim 10, further comprising:
 - generating a second pattern of a haptic substrate in response to a second activating signal; and
 - forcing a flexible surface layer against the second pattern of the haptic substrate to change surface texture of the flexible surface layer from the second surface characterization to a third surface characterization in response to the second pattern.
19. A tactile device, comprising:
 - a transparent grille having a predefined pattern of openings;
 - a haptic deformable material layer coupled to the transparent grille and capable of partially changing its shape in accordance with an activating signal and the predefined pattern of openings; and
 - a transparent substrate coupled to the deformable transparent material layer and configured to provide haptic force feedback for controlling the deformable transparent material layer in accordance with the transparent grille.
20. The device of claim 19, wherein the haptic deformable material layer includes a plurality of flexible haptic actuators.
21. The device of claim 20, wherein the haptic flexible haptic actuators are made from one of electroactive polymers and shape memory alloy capable of being activated independently.
22. The device of claim 19, wherein surface topography of the transparent grille is capable of changing from a first surface characteristic to a second surface characteristic in response to the activating signal.
23. The device of claim 22, wherein the surface topography of the transparent grille is capable of changing from a first surface characteristic to a second surface characteristic further includes changing the surface topography of the transparent grille from a smooth texture to a coarse texture.
24. The device of claim 19, wherein the transparent grille is a touch-sensitive surface capable of sensing an input.
25. A haptic interface device comprising:
 - a display layer operable to display viewable images;
 - a touch screen layer disposed over the display layer and capable of receiving an input by sensing one or more surface contacts;
 - a haptic mechanism layer disposed over the touch screen layer and capable of providing one of a plurality of surface patterns in response to an activating command; and